

RECLAMATION

Managing Water in the West

Western Water Resources and Climate Change

www.usbr.gov/climate

Presentation to CEQ

July 14, 2011

David Raff, PhD, PE

U.S. Department of the Interior
Bureau of Reclamation



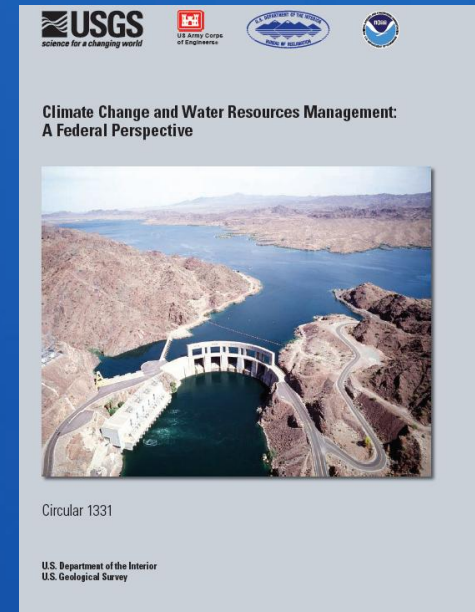
Background

From USGS Circular 1331 (Brekke et al. 2009)

- **Climate change is occurring, although the effects differ regionally.**
- **All sectors of water resources management could be affected; hydroclimate conditions becoming non-stationary.**
- **Climate change is but one of many challenges facing water resource managers.**

From SECURE Water Act (PL 111-11)

- **...although States bear the primary responsibility and authority for managing the water resources of the United States...**
- **Federal agencies that conduct water management have a responsibility to take a lead role in assessing risks to the water resources and to develop adaptation and mitigation strategies**



RECLAMATION

Climate Change Players



I want to know
how climate
change affects
resources

I want to know
how climate
change affects
resources



RECLAMATION

Climate Change Players



I want the
answer.

I want to
understand
GCM
variability.

I want to
understand
uncertainty
propagation



RECLAMATION

Climate Change Players



I want the
answer.

I want to know
about
downscaling
methodologies.

I want to know
how this model
compares to
that model



RECLAMATION

Climate Change Players



MUST HAVE CAPACITY

To Define Mission Relevance,
Goals and Options



RECLAMATION

Climate Change Relevance

Agency **Mission / Goals** / Options

- **Mission**

- (Potential Vulnerabilities)

- Water Delivery
- Hydropower
- Recreation
- Fish and Wildlife Habitat
- ESA
- Flood Control

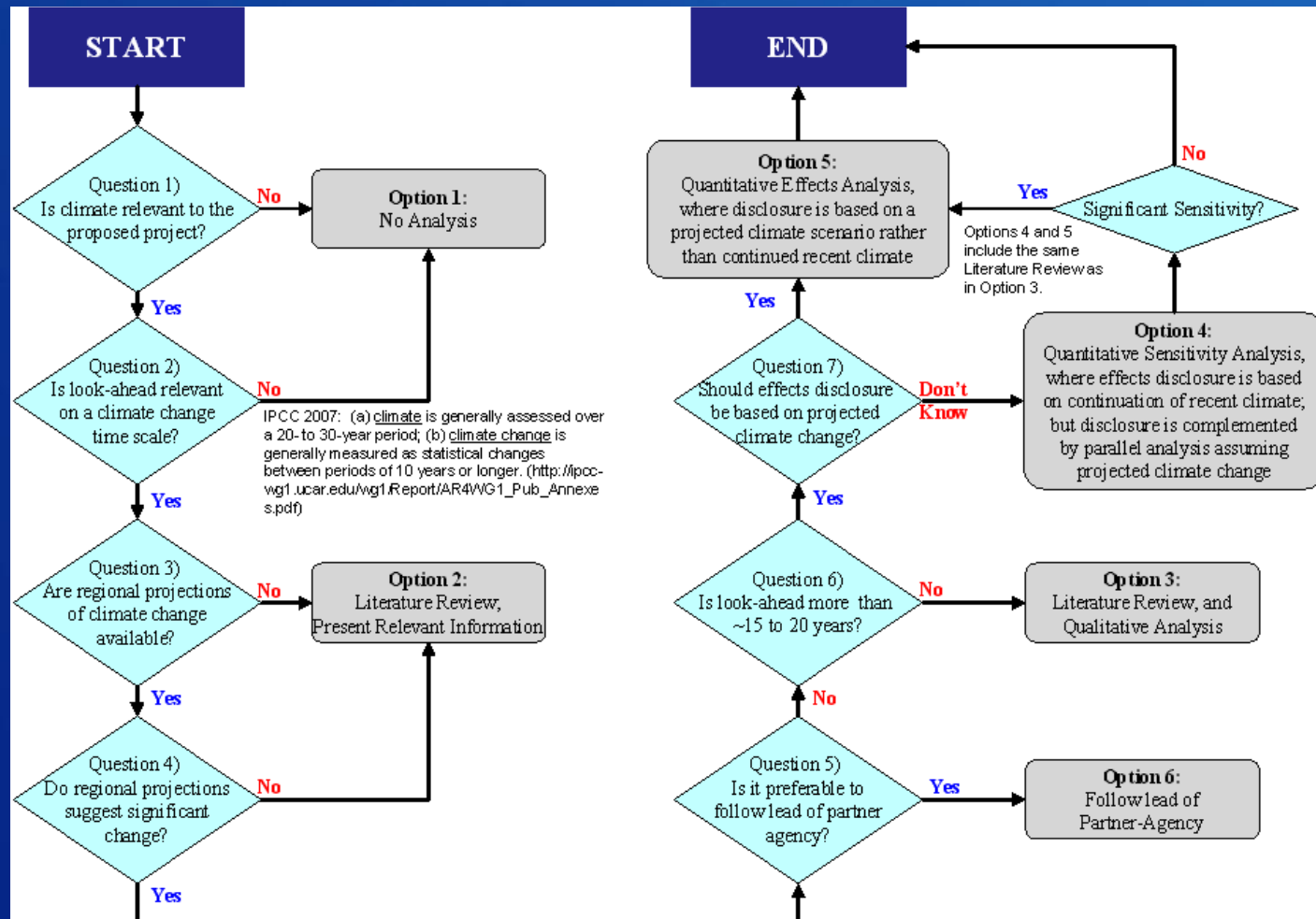
- **Goals (Adaptation / Mitigation)**

- Bring the right information to bear to reduce vulnerability
- Not always Quantitative not always GCMs – downscaling – physical models...

RECLAMATION

Climate Change Relevance

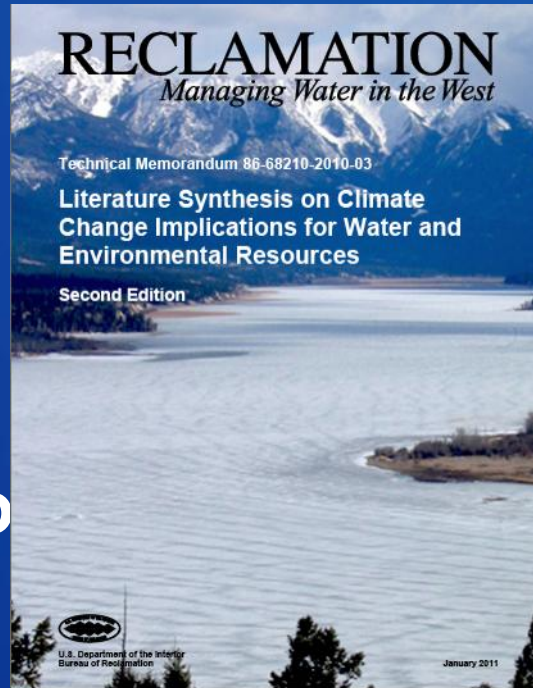
Agency Mission / Goals / Options



RECLAMATION

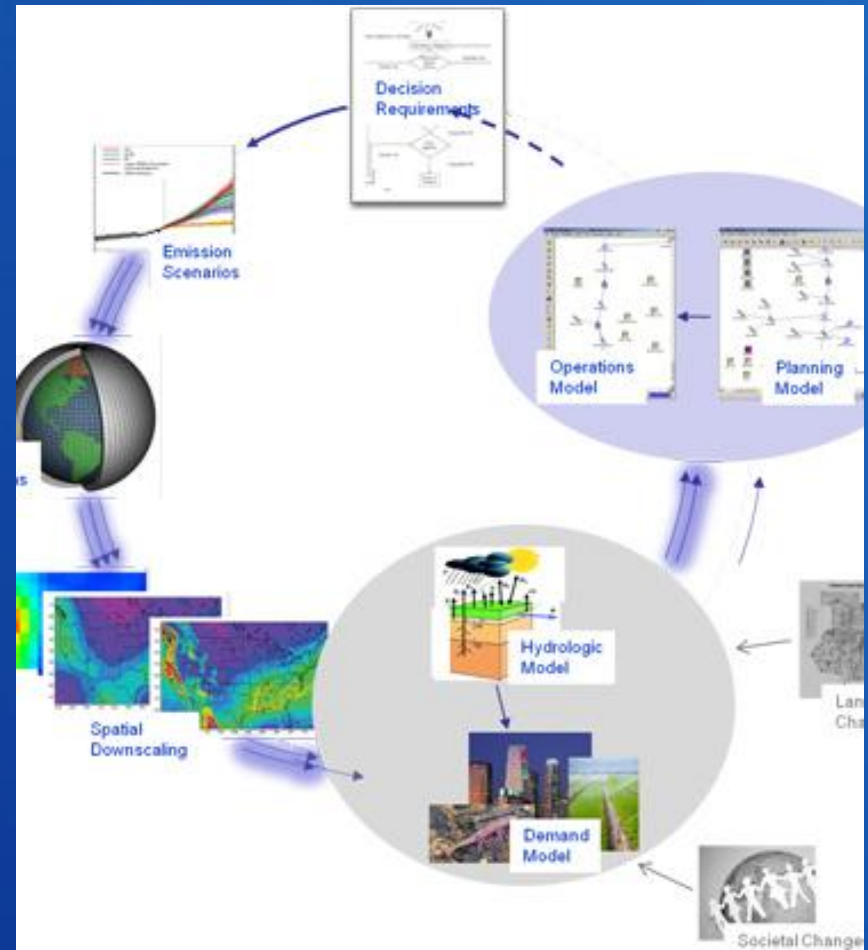
Qualitative Information – Vulnerability Assessment

- Literature Synthesis
- WaterSMART Clearinghouse of Information



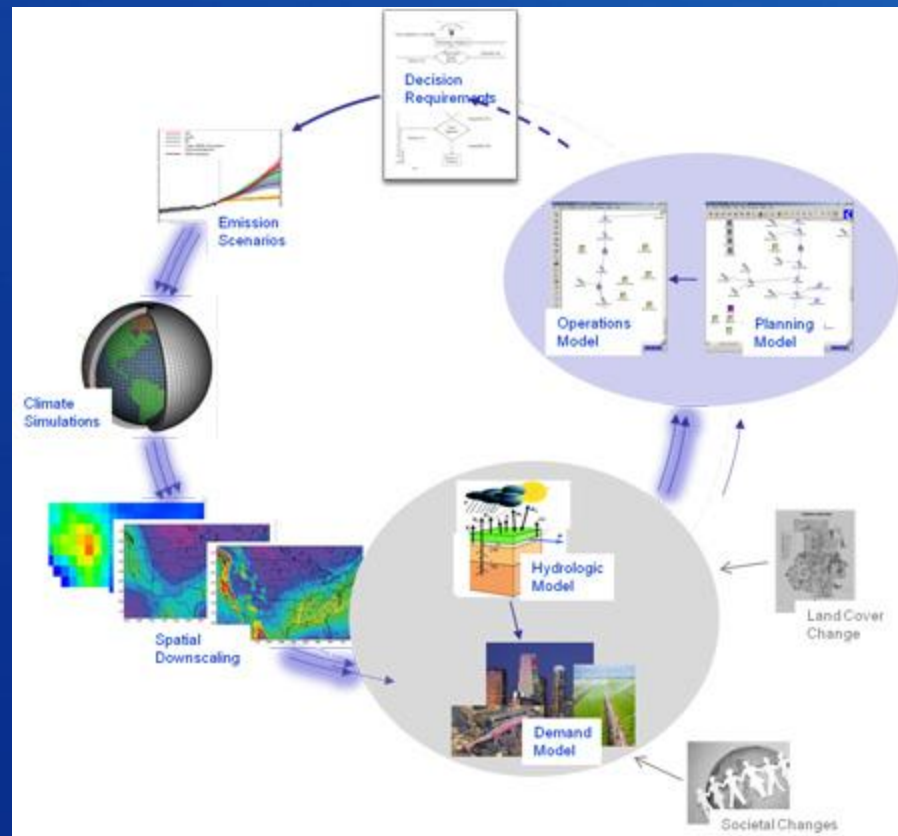
Quantitative Assessment

- Architecture
- Data / Information / Tool Supply
- Execution
- Presentation



RECLAMATION

Architecture for Climate Change and Water Resources



RECLAMATION

Can't Start From Scratch

LEVERAGE
LEVERAGE
LEVERAGE

- Tools
- Data
- Methods
- Presentation
Styles and
Graphics!!!

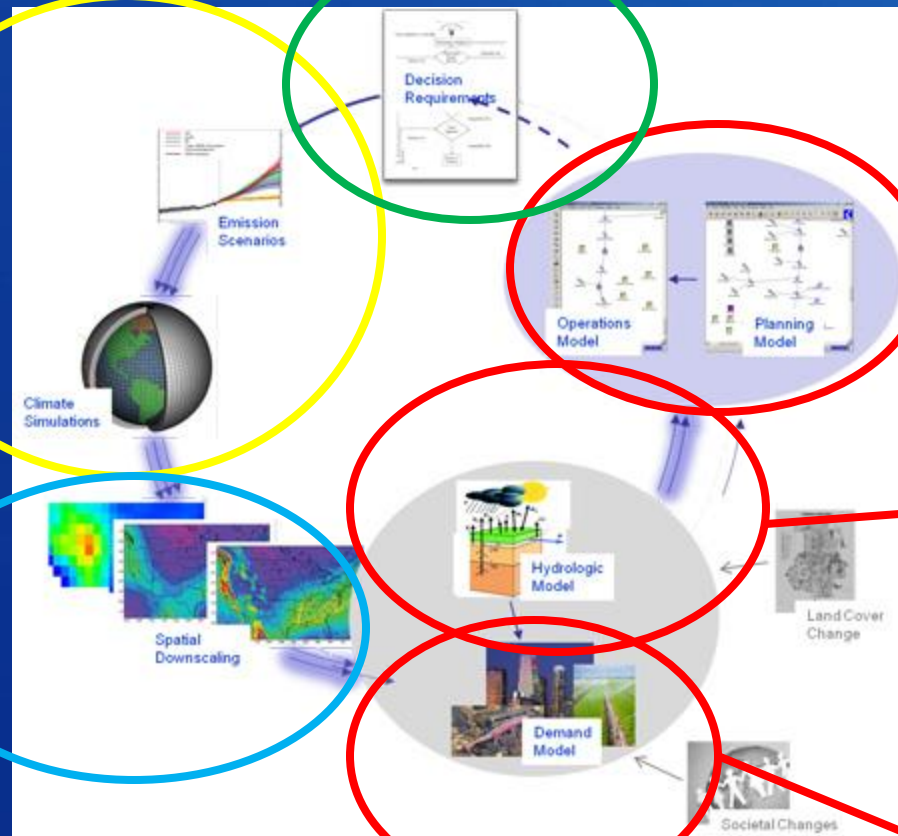
RECLAMATION

Architecture for Climate Change and Water Resources

With Stakeholders
e.g. CO Basin Study

CMIP3 &
Updates

Reclamation /
Santa Clara /
USACE / DOE
BCSD 2008 &
Updates



Historical
Development

VIC – University
of Washington

Penman
Monteith

RECLAMATION

Many Activities Support Development - Examples

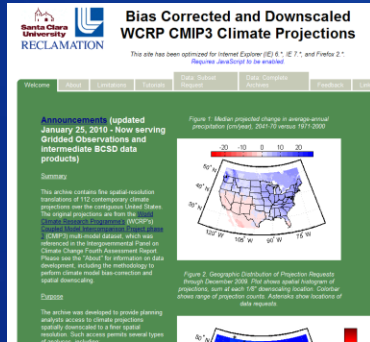
- **New Activities within WaterSMART**
 - Basin Studies
 - Landscape Conservation Cooperatives (Future)
- **Reclamation Research and Development Office**
 - Climate Downscaling
 - Literature Synthesis
- **Collaborations with Universities**
 - Hydrology Modeling
- **Reclamation Regional and Area Offices**
 - Basin Specific Planning / Operations Tools
 - All Reclamation Regions

RECLAMATION

West-Wide Climate Risk Assessments (WWCRA) - Hydrologic Projections (2011)

112 Transient Climate Projections...

http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html



112 Transient Hydrologic Projections covering western U.S....



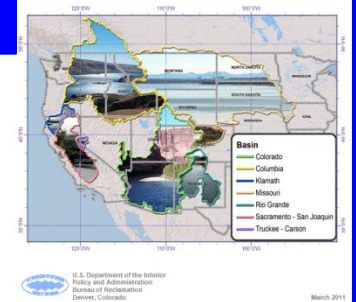
Data-service,
Reclamation and
broader public use
(Summer 2011)

SECURE Report to
Congress, 2011
focus on median
changes; future
reports have broader
scope

Analyses of Period-
changes in climate
and hydrology

RECLAMATION Managing Water in the West

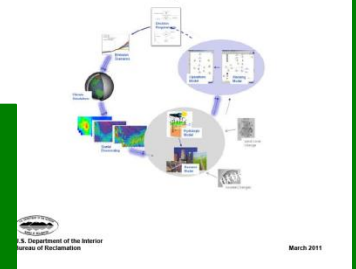
SECURE Water Act
Section 9503(c) – Reclamation
Climate Change and Water
2011 DRAFT



RECLAMATION Managing Water in the West

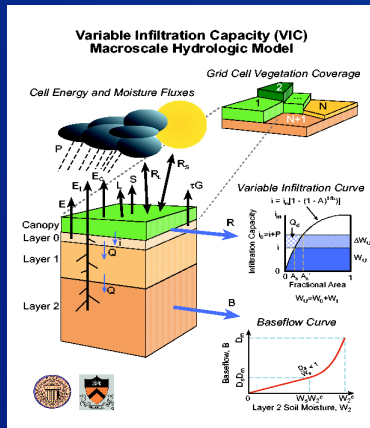
Technical Memorandum No. 86-68210-2011-01

West-Wide Climate Risk
Assessments: Bias-Corrected
and Spatially Downscaled
Surface Water Projections



Technical Report,
data-development
(TSC 86-68210,
March 2011)

8 “big basin” VIC
hydrology model-apps
from Univ. of WA...



RECLAMATION

2020s-1990s

2050s-1990s

2070s-1990s

2070s-1990s, Ensemble-Median

▲ +15% ▼ -15%
 ▲ +10% ▼ -10%
 • +5% ▼ -5%

2050s-1990s, Ensemble-Median

▲ +15% ▼ -15%
 ▲ +10% ▼ -10%
 ● +5% ▼ -5%

2070s-1990s, Ensemble-Median

▲ +15% ▼ -15%
 ▲ +10% ▼ -10%
 ▲ +5% ▼ -5%

2050s-1990s, Ensemble-Median

▲ +15% ▼ -15%
 ▲ +10% ▼ -10%
 ● +5% ▼ -5%

2070s-1990s, Ensemble-Median

▲ +15% ▼ -15%
 ■ +10% ■ -10%
 ★ +5% ★ -5%

Available for Leveraging

Bias Corrected and Downscale x

140.215.62.7/wwcra/DcpInterface.html#Data%20Subset%20Request

BCSD etas gwt maps shapefile USGS WaterWatch -- ...

Page 1: Products, Variables, Projections Page 2: Temporal & Spatial Extent Page 3: Analysis, Format, & Notification

Step 2.3: Time Period(s) ?

BCSD monthly data Jan 1950 through Dec 2099


Step 2.4: Vic application and capture area ?

☐ View All ☐ California ☒ Colorado ☐ Great Basin ☐ Rio Grande
☐ Missouri ☐ Pacific Northwest ☐ Arkansas-Red ☐ Gulf

Select VIC app and click on map to select capture area within Vic app boundary.

Lat: 45.9206 Lon: -96.5918

Terrain



©2011 Google - Map data ©2011 Europa Technologies, Google, INEGI - Terms of Use

Quantitative Assessments Never Done

Demands

- **FY 2011 – Analyze Agricultural Demands utilizing legacy tools with climate projections**
- **FY 2012 – Put FY 2011 activities within broader context of scenario planning (similar to CO Basin Study Approach).**

Sector Impacts

- Hydropower
- Ecological Resiliency
- Endangered Species
- Recreation
- Water Deliveries
- Water Quality

RECLAMATION

Thank You Questions?



RECLAMATION